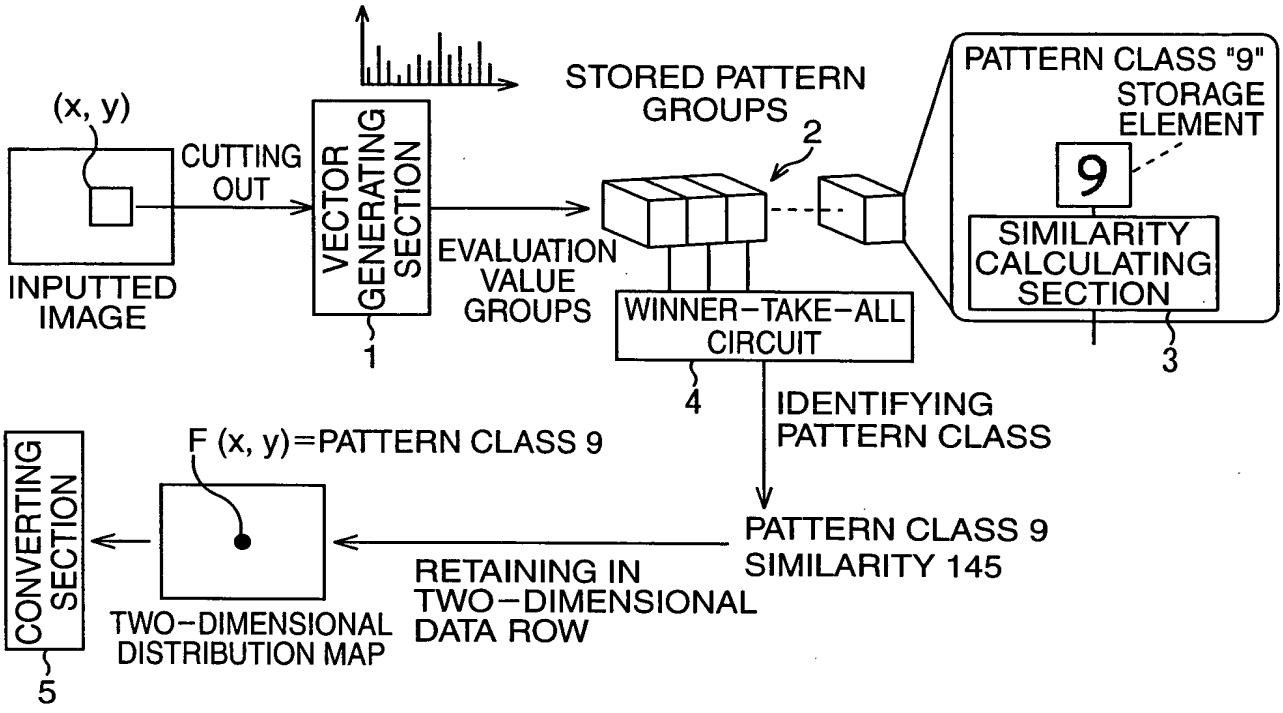
FIG. 1A



SCHEMATIC DIAGRAM OF WHOLE SYSTEM

FIG. 1B

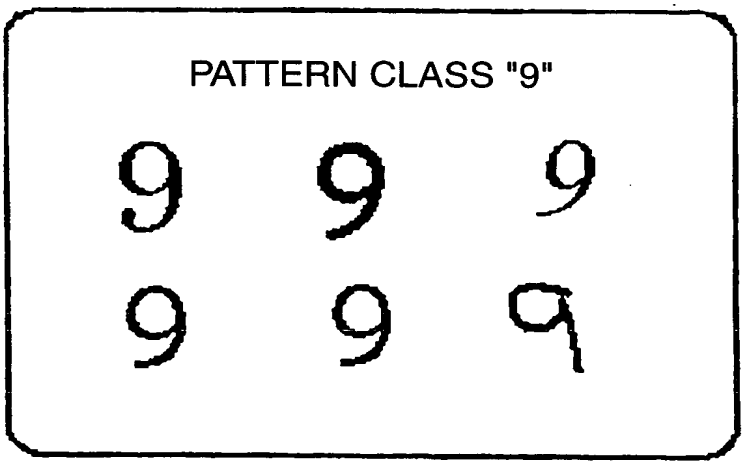
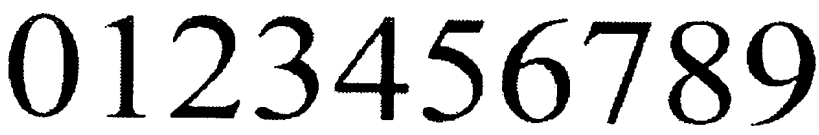


FIG. 2



DHARACTERS OF 72PT TIMES NEW ROMAN
FONT USED AS TEMPLATES

FIG. 3

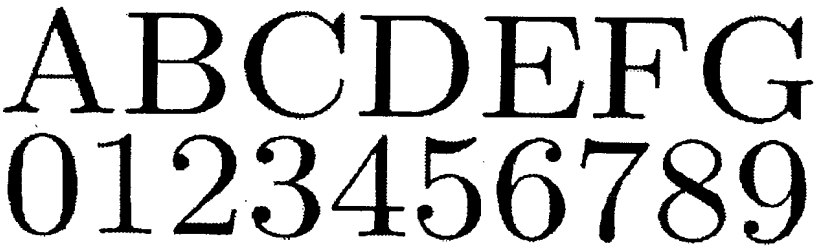


FIG. 4

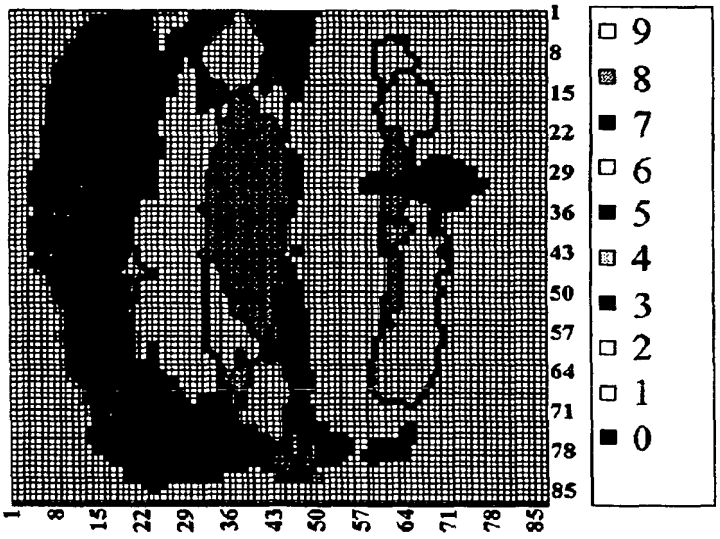

1
8
15
22
29
36
43
50
57
64
71
78
85
9
8
7
6
5
4
3
2
1
0

FIG. 5

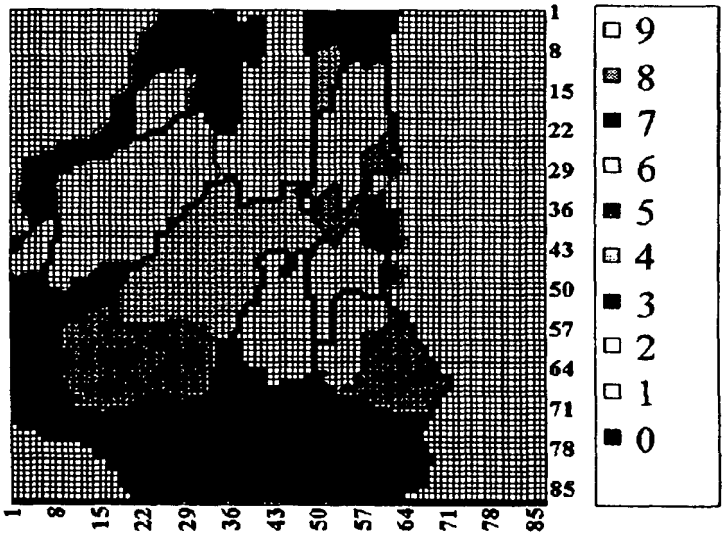

1
8
15
22
29
36
43
50
57
64
71
78
85
9
8
7
6
5
4
3
2
1
0

FIG. 6

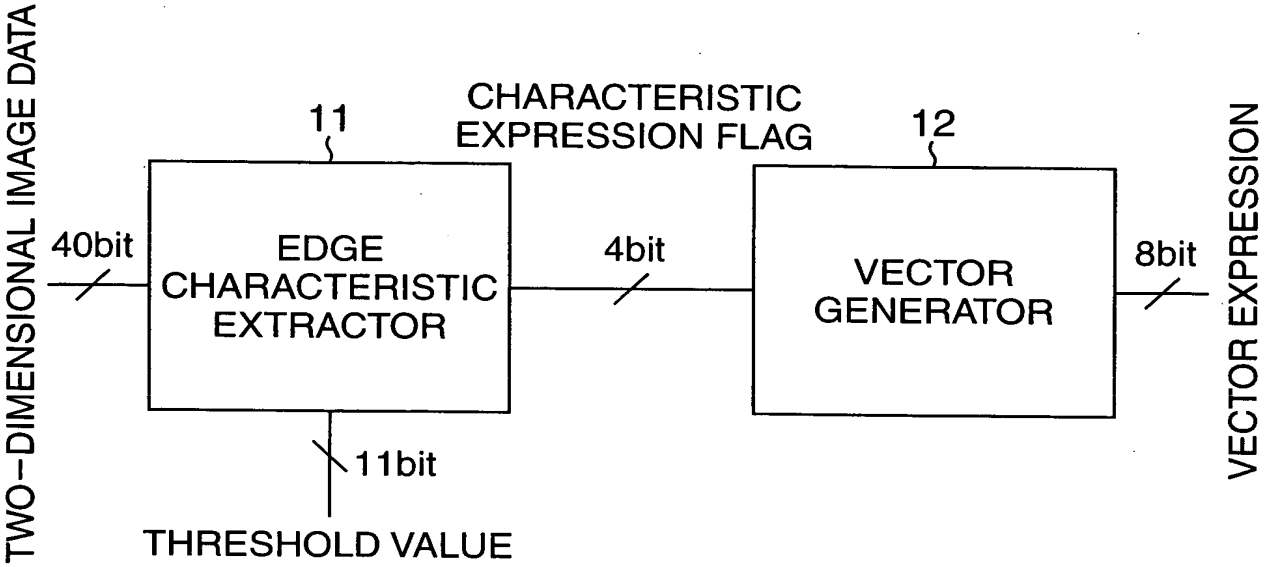

TWO-DIMENSIONAL IMAGE DATA
40bit
11
EDGE CHARACTERISTIC EXTRACTOR
11bit
THRESHOLD VALUE
CHARACTERISTIC EXPRESSION FLAG
4bit
12
VECTOR GENERATOR
8bit
VECTOR EXPRESSION

FIG. 7

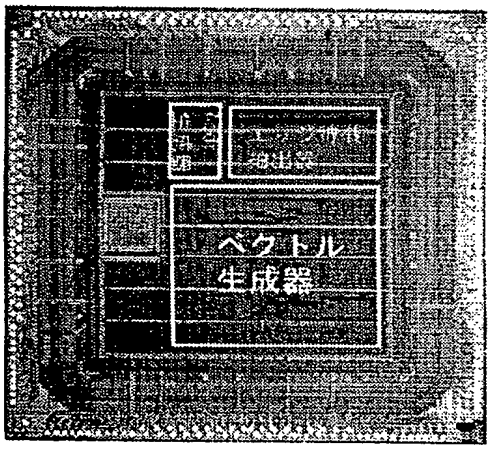

ベクトル
生成器

FIG. 8

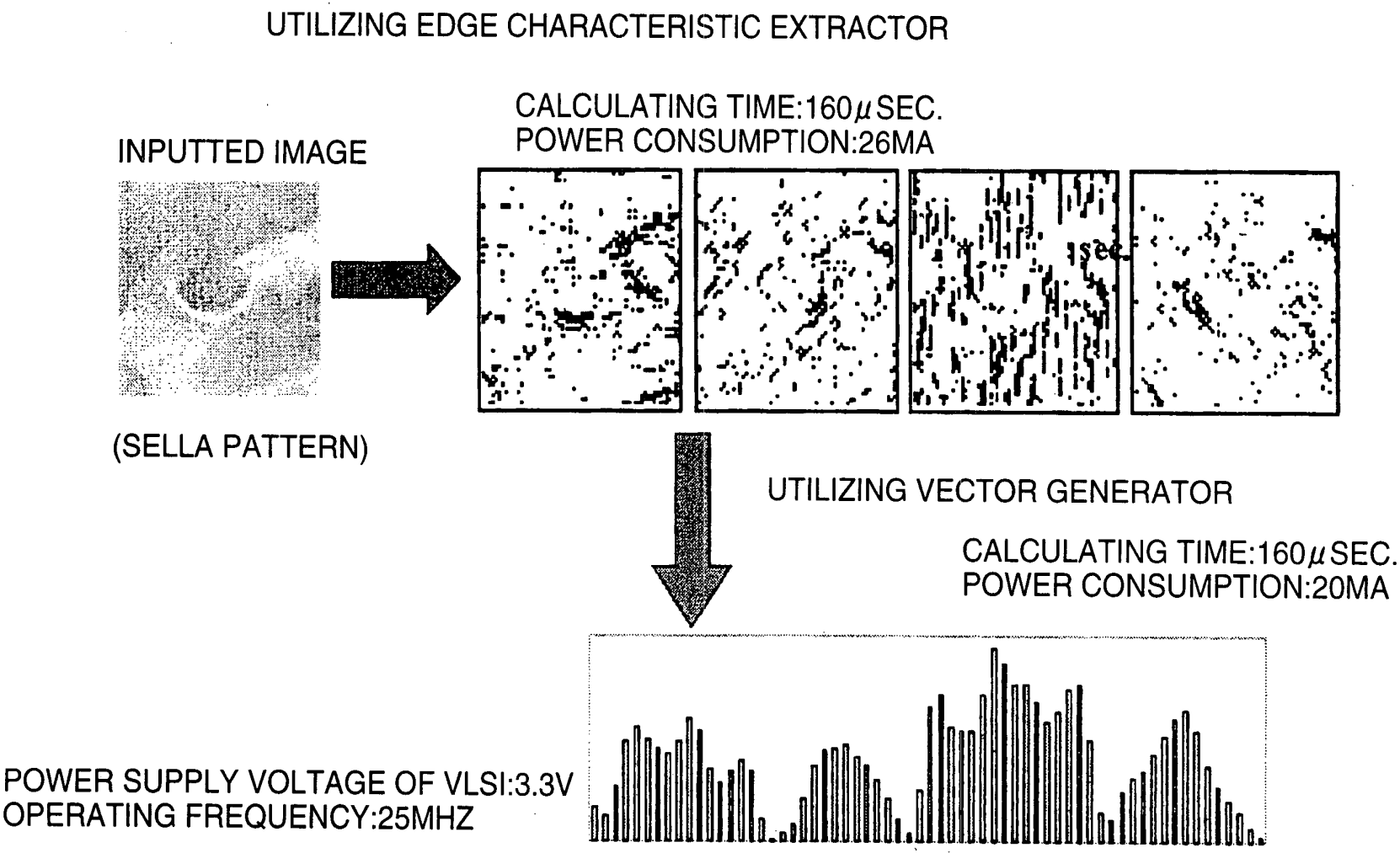

UTILIZING EDGE CHARACTERISTIC EXTRACTOR
CALCULATING TIME:160μSEC.
POWER CONSUMPTION:26MA
INPUTTED IMAGE
(SELLA PATTERN)
UTILIZING VECTOR GENERATOR
CALCULATING TIME:160μSEC.
POWER CONSUMPTION:20MA
POWER SUPPLY VOLTAGE OF VLSI:3.3V
OPERATING FREQUENCY:25MHZ

FIG. 9

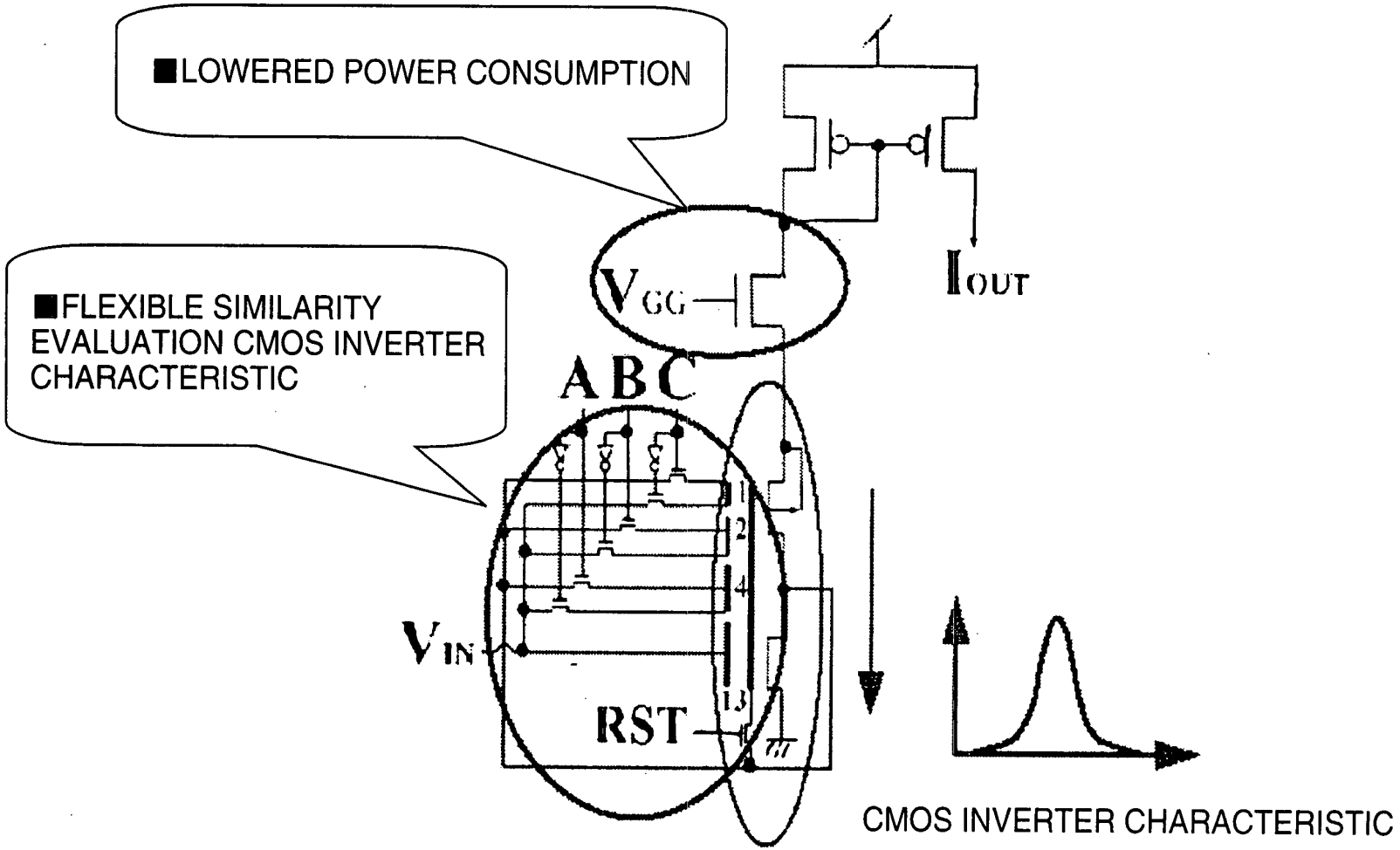

■LOWERED POWER CONSUMPTION
■FLEXIBLE SIMILARITY EVALUATION CMOS INVERTER CHARACTERISTIC
VGG
IOUT
ABC
VIN
RST
1
2
4
13
CMOS INVERTER CHARACTERISTIC

FIG. 10

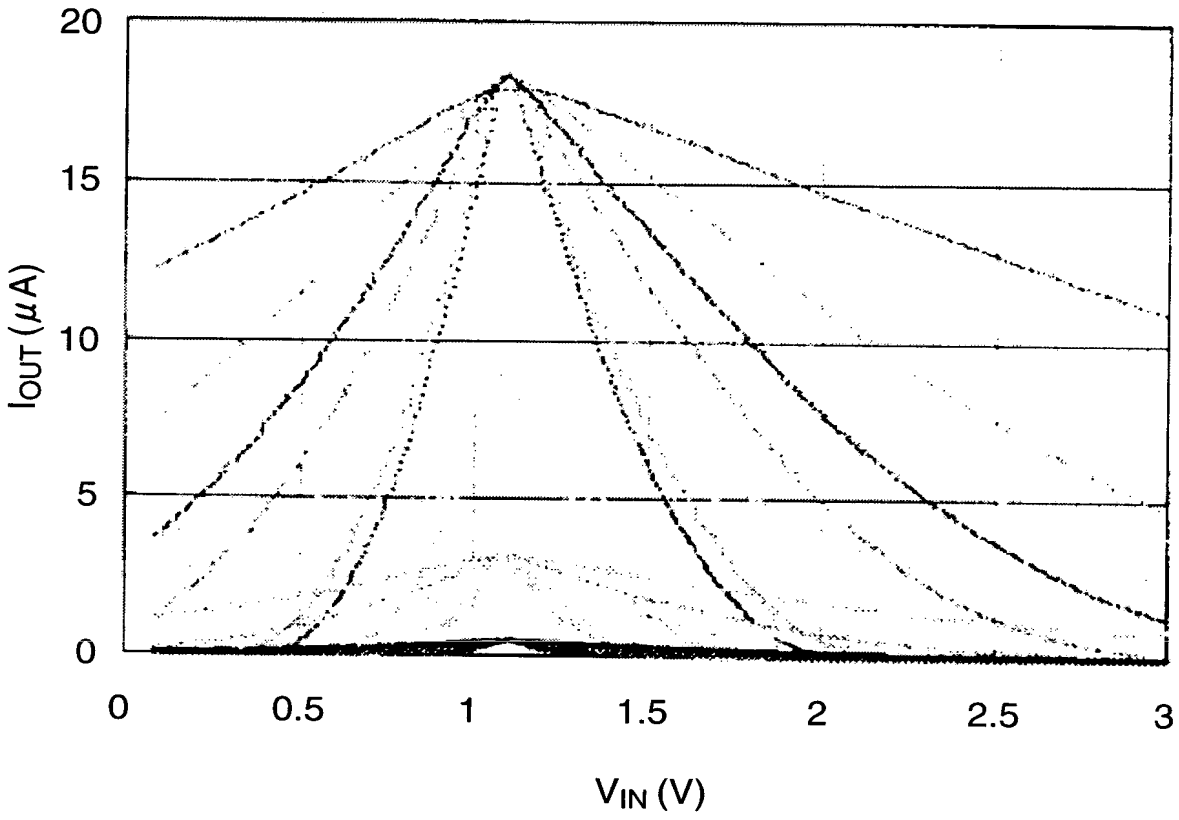


FIG. 11

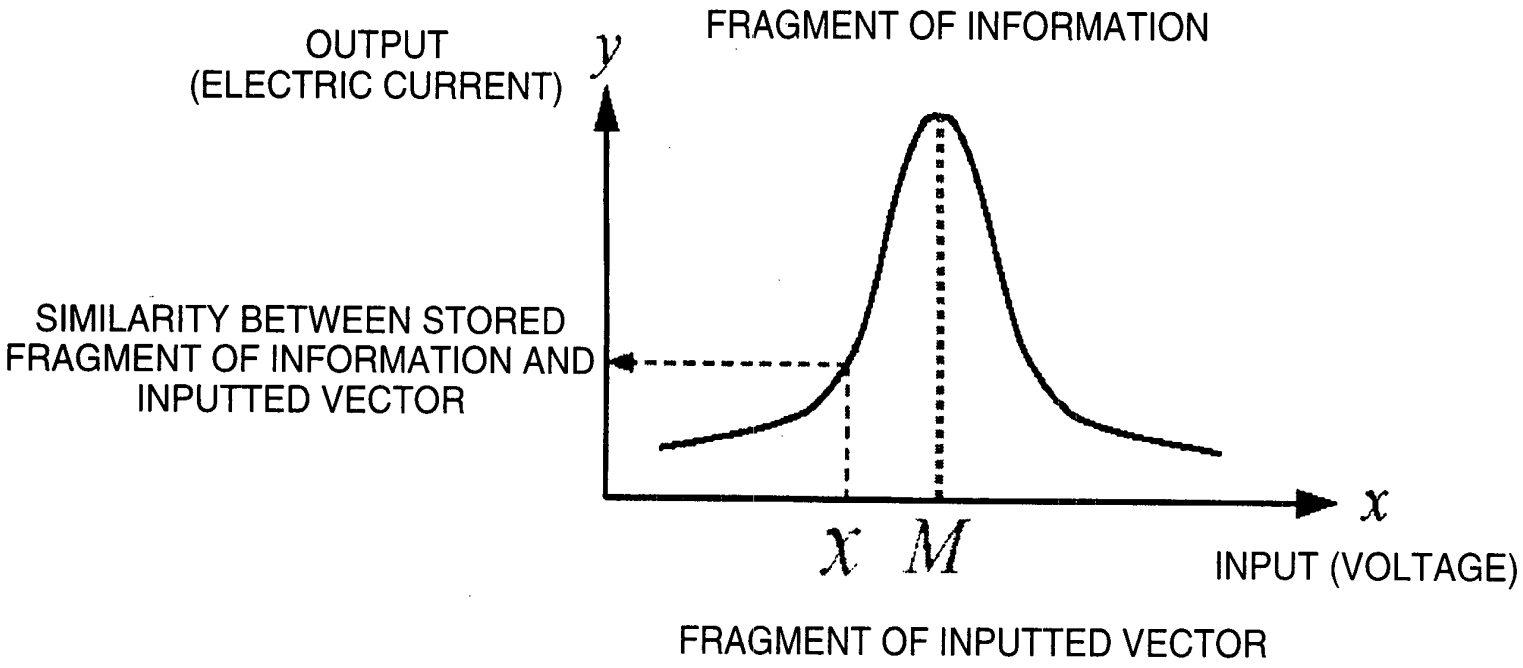

FRAGMENT OF INFORMATION
OUTPUT
(ELECTRIC CURRENT)
y
SIMILARITY BETWEEN STORED
FRAGMENT OF INFORMATION AND
INPUTTED VECTOR
x
x M
INPUT (VOLTAGE)
FRAGMENT OF INPUTTED VECTOR

FIG. 12

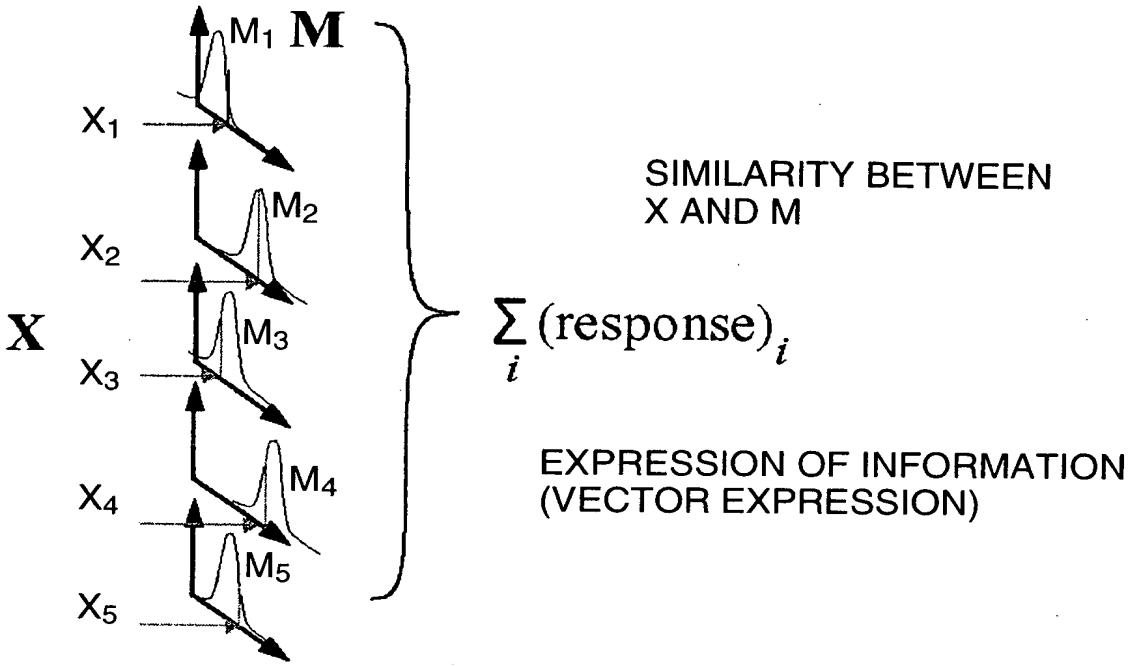

M1 M
X1
M2
X2
X
M3
X3
M4
X4
M5
X5
SIMILARITY BETWEEN X AND M
$\sum_i (\text{response})_i$
EXPRESSION OF INFORMATION (VECTOR EXPRESSION)

FIG. 13

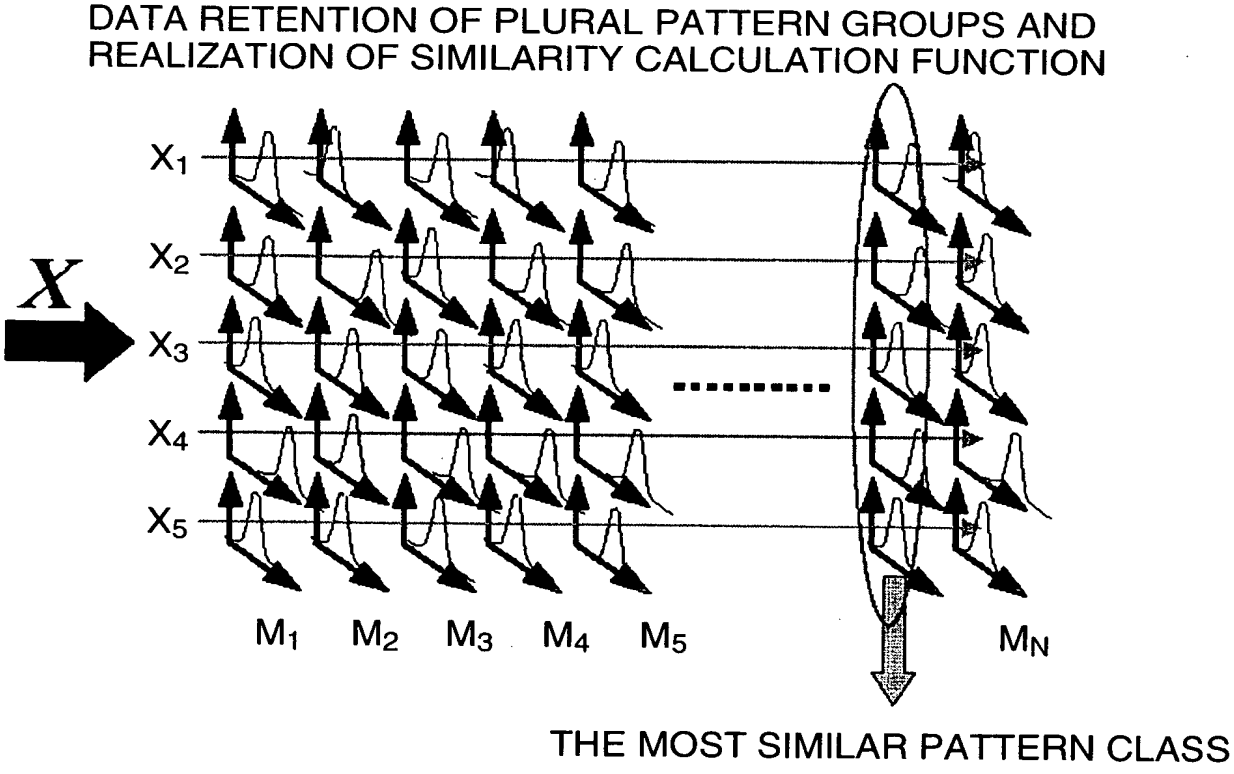

DATA RETENTION OF PLURAL PATTERN GROUPS AND REALIZATION OF SIMILARITY CALCULATION FUNCTION
X
X1
X2
X3
X4
X5
M1 M2 M3 M4 M5
MN
THE MOST SIMILAR PATTERN CLASS

FIG. 14

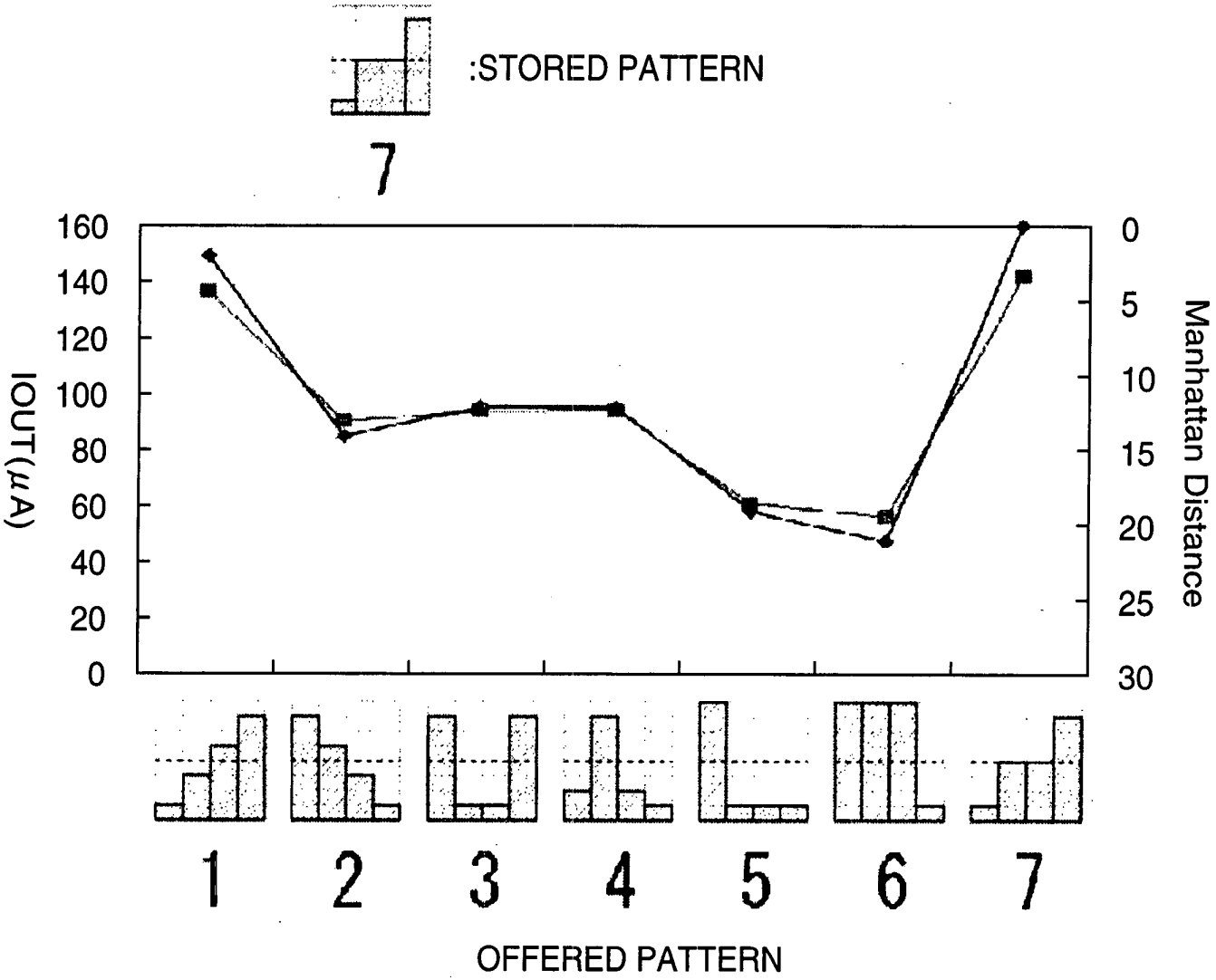

:STORED PATTERN
7
160
140
120
100
80
60
40
20
0
IOUT(μA)
0
5
10
15
20
25
30
Manhattan Distance
1
2
3
4
5
6
7
OFFERED PATTERN

FIG. 15

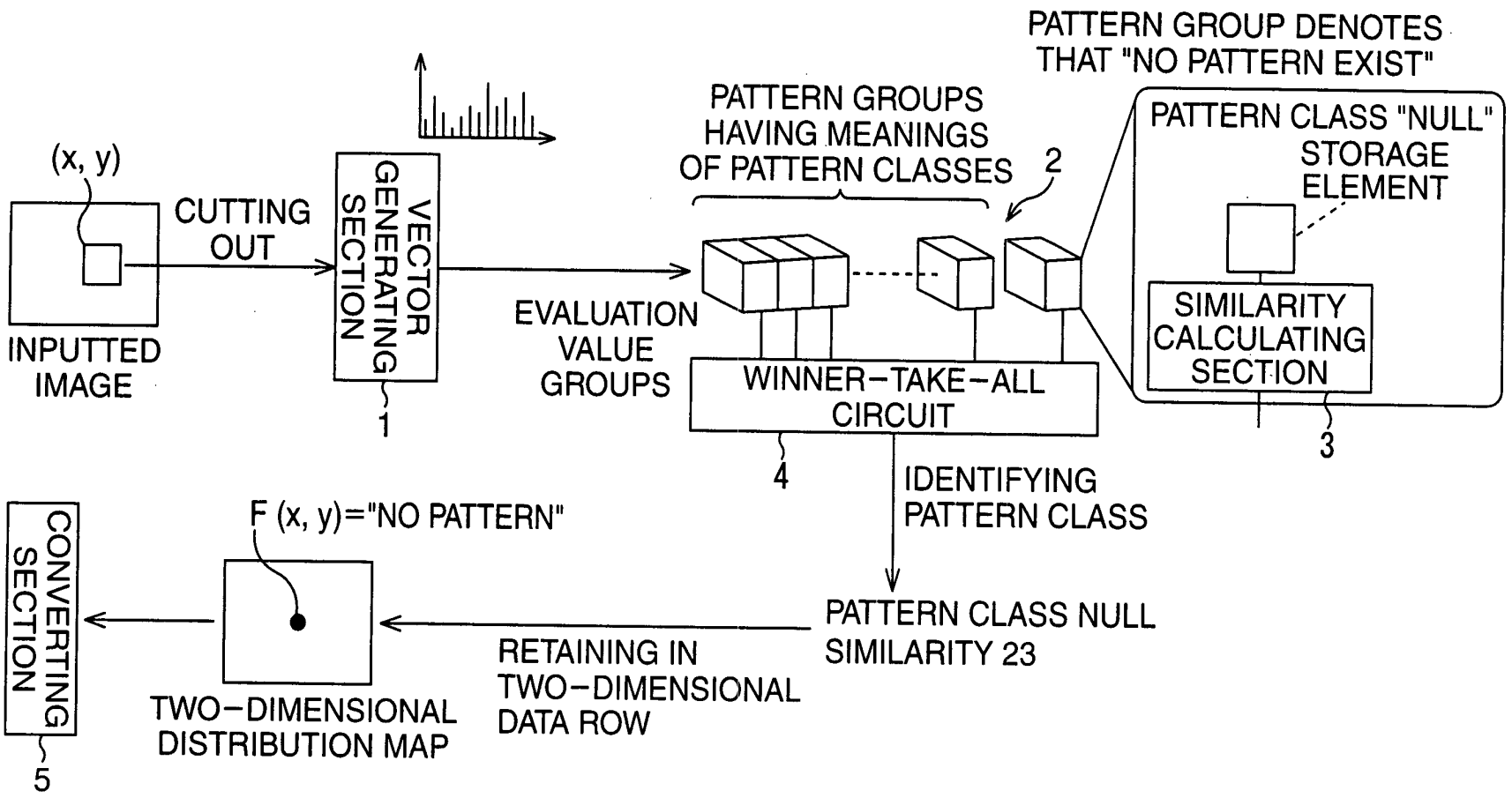

PATTERN GROUP DENOTES THAT "NO PATTERN EXIST"
PATTERN GROUPS HAVING MEANINGS OF PATTERN CLASSES
2
PATTERN CLASS "NULL" STORAGE ELEMENT
(x, y)
CUTTING OUT
VECTOR GENERATING SECTION
INPUTTED IMAGE
1
EVALUATION VALUE GROUPS
WINNER-TAKE-ALL CIRCUIT
SIMILARITY CALCULATING SECTION
3
4
IDENTIFYING PATTERN CLASS
F (x, y)="NO PATTERN"
CONVERTING SECTION
PATTERN CLASS NULL SIMILARITY 23
RETAINING IN TWO-DIMENSIONAL DATA ROW
TWO-DIMENSIONAL DISTRIBUTION MAP
5

FIG. 16

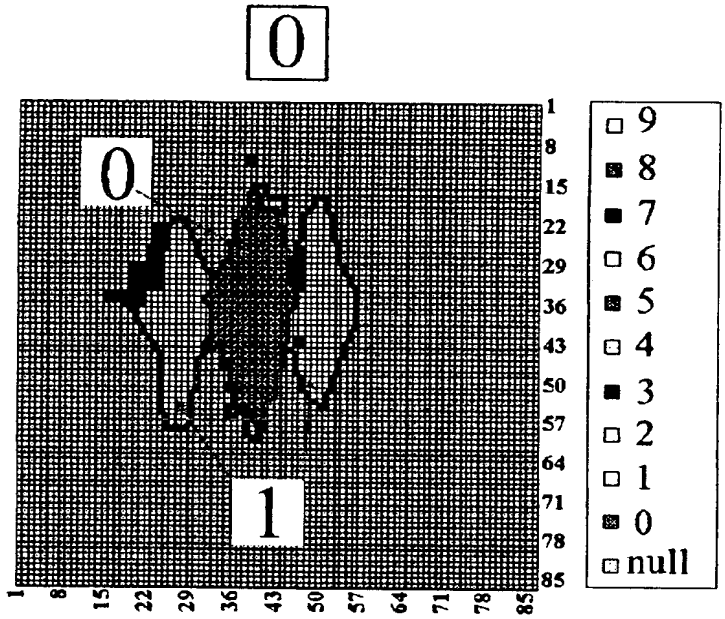

0
0
1
1
8
15
22
29
36
43
50
57
64
71
78
85
9
8
7
6
5
4
3
2
1
0
null

FIG. 17

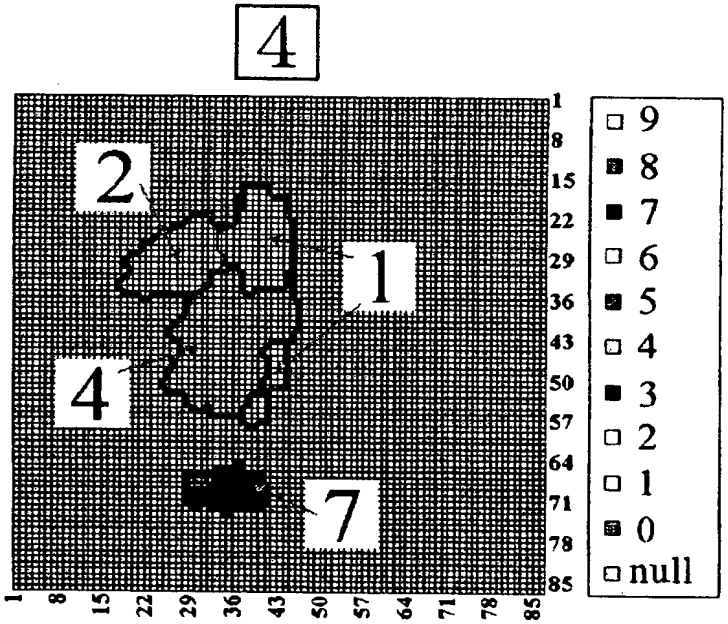

4
2
1
4
7
1
8
15
22
29
36
43
50
57
64
71
78
85
9
8
7
6
5
4
3
2
1
0
null

FIG. 18

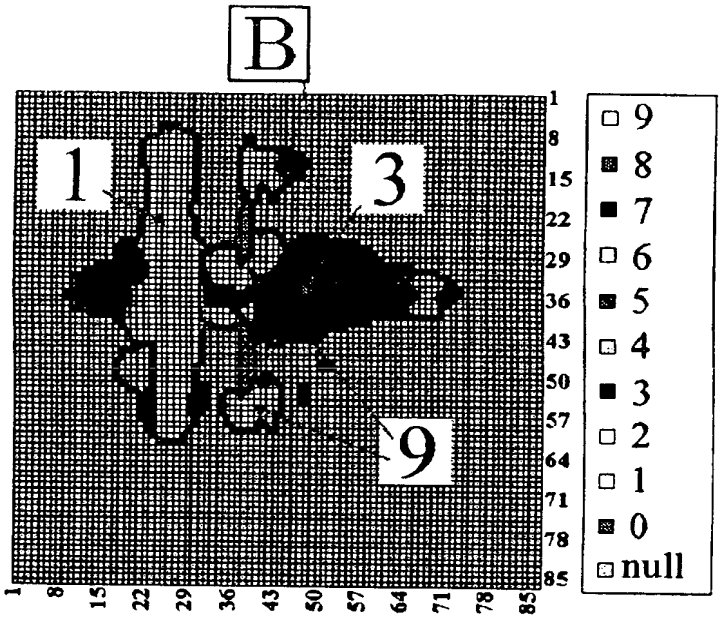


FIG. 19A

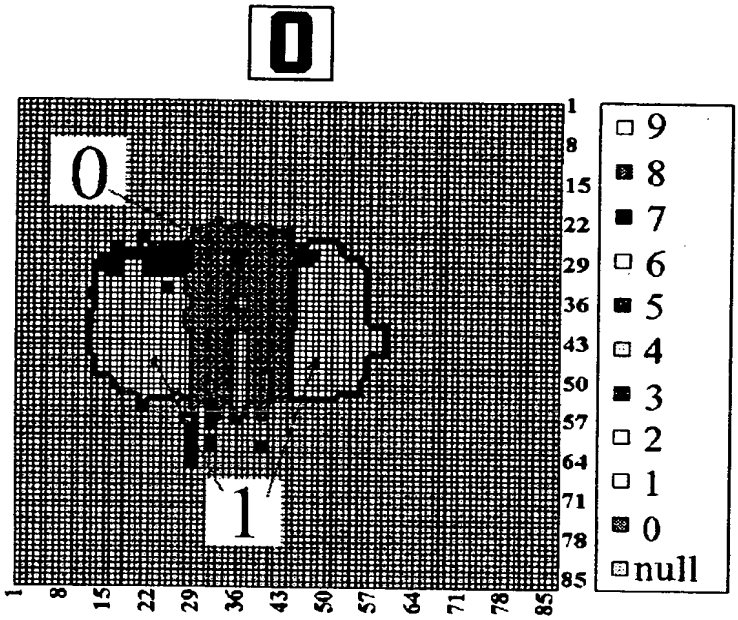


FIG. 19B

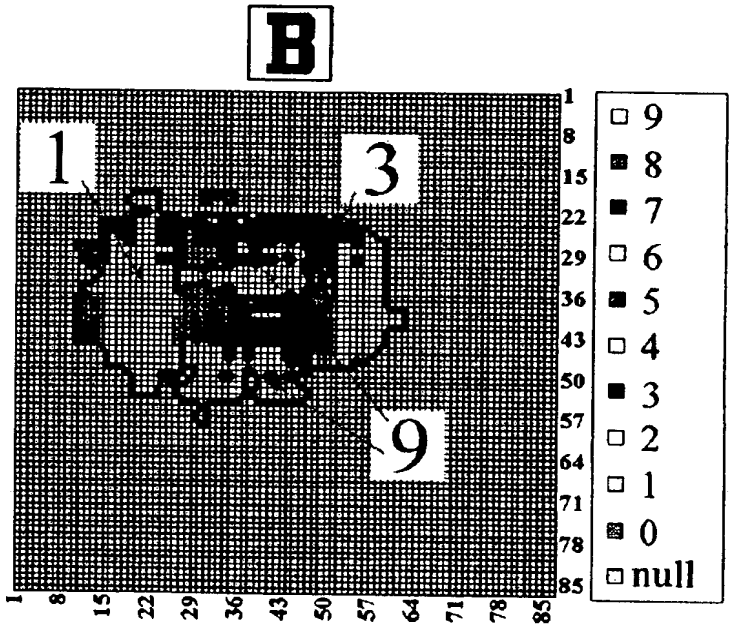


FIG. 20A

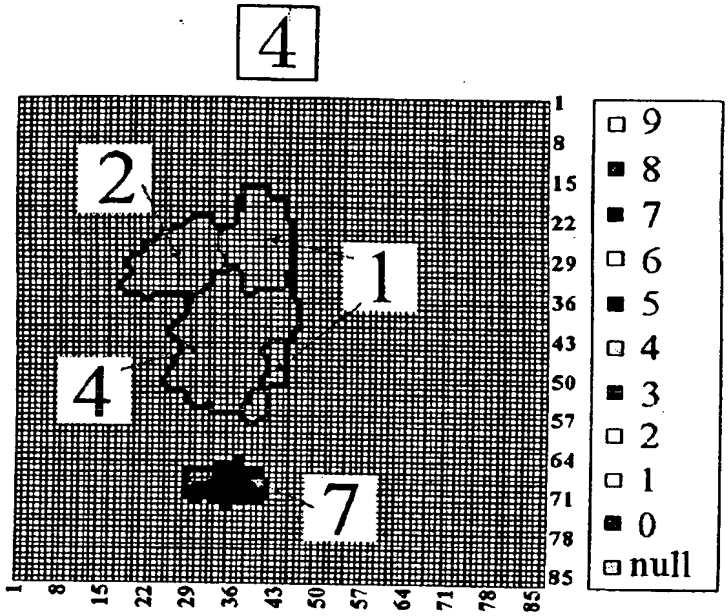


FIG. 20B

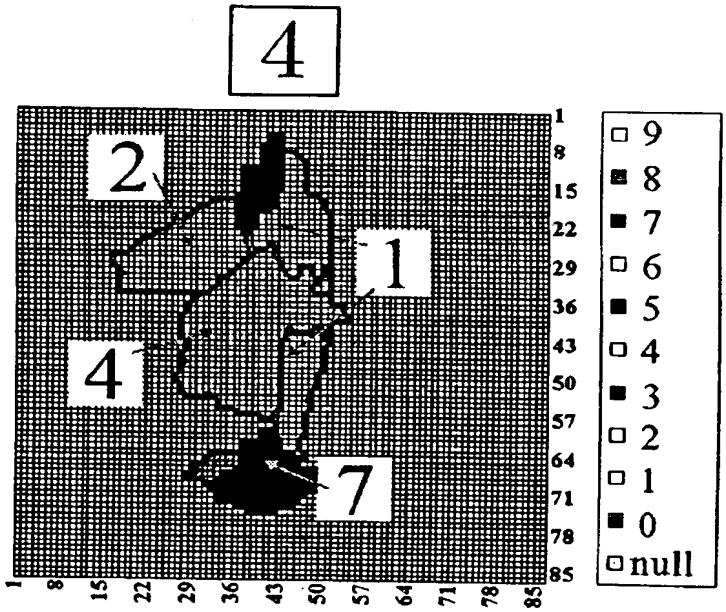


FIG. 21A

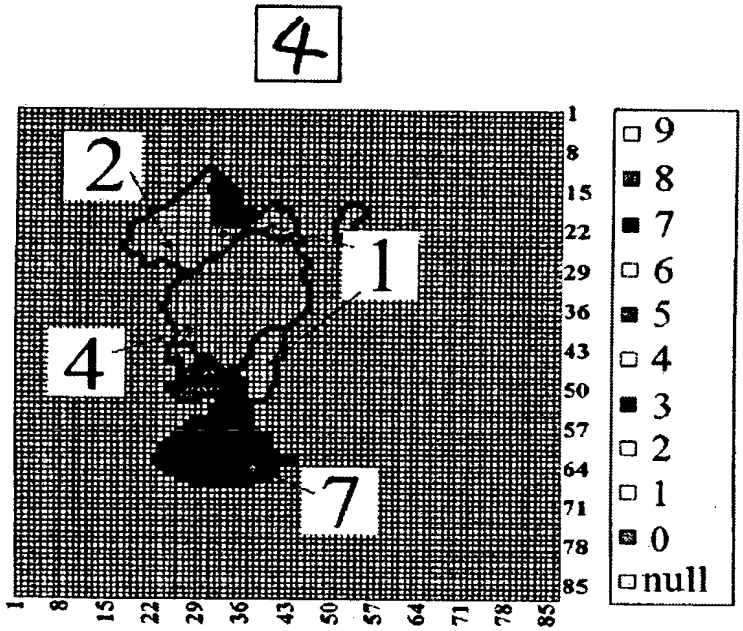


FIG. 21B

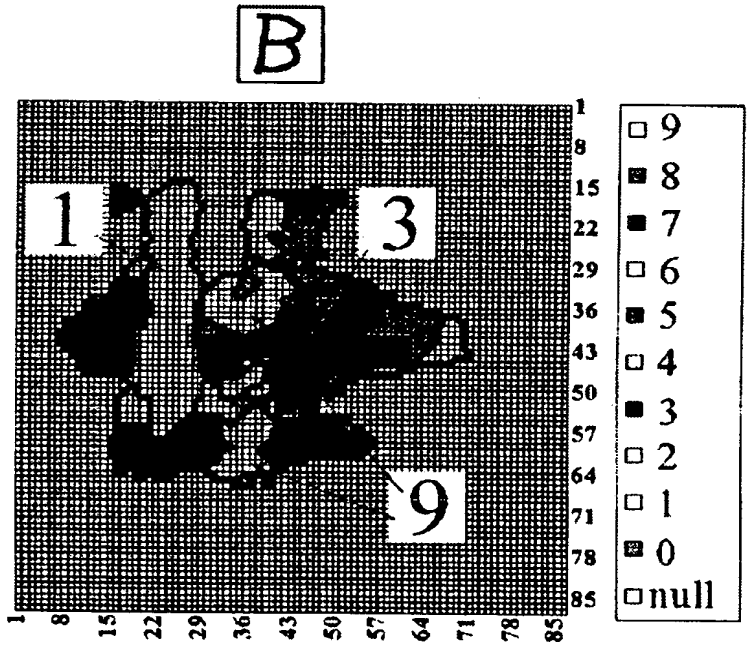


FIG. 22

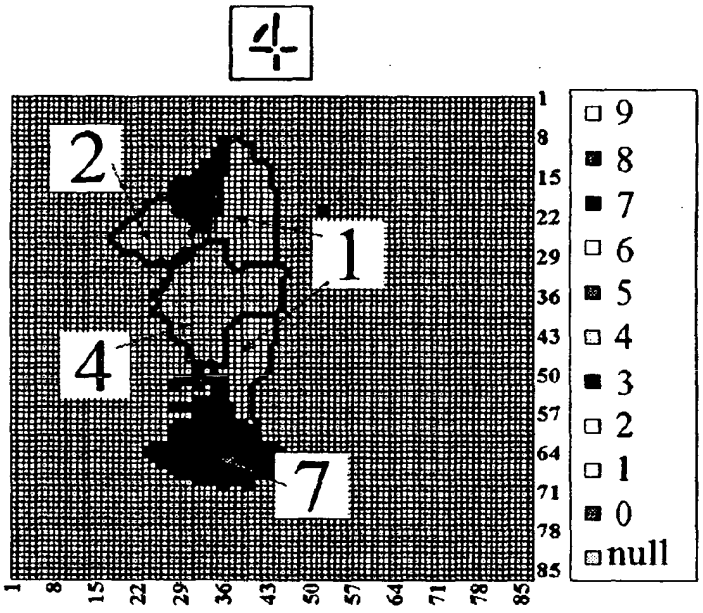


FIG. 23A

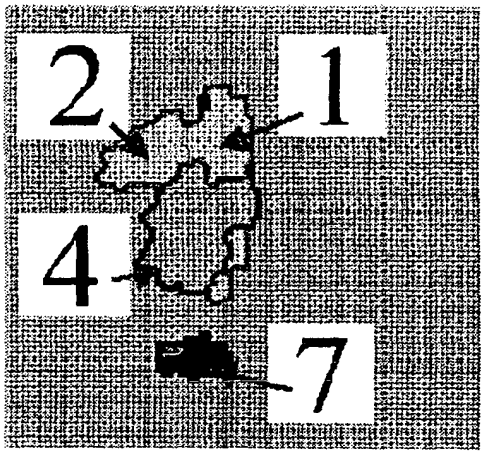


FIG. 23B

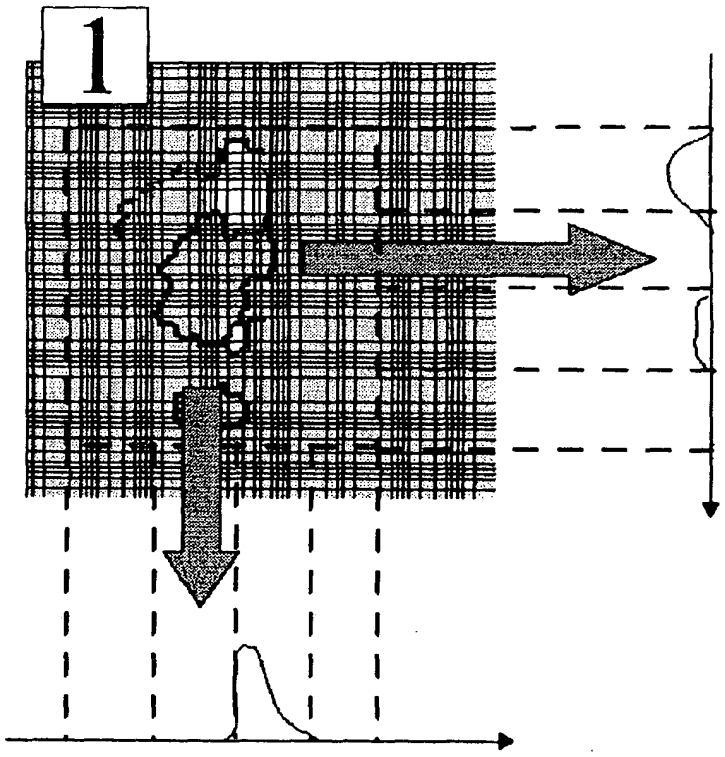


FIG. 24

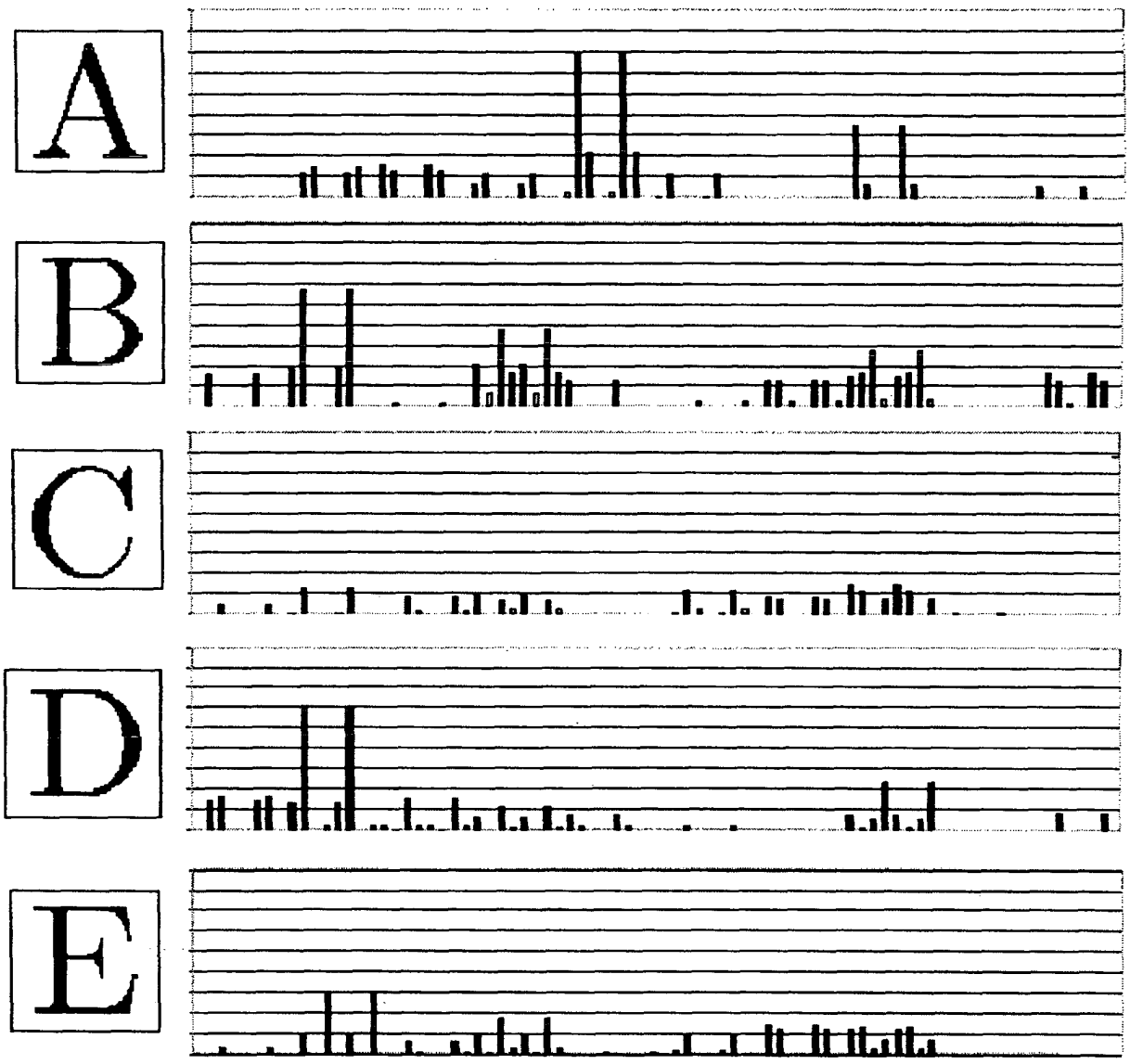
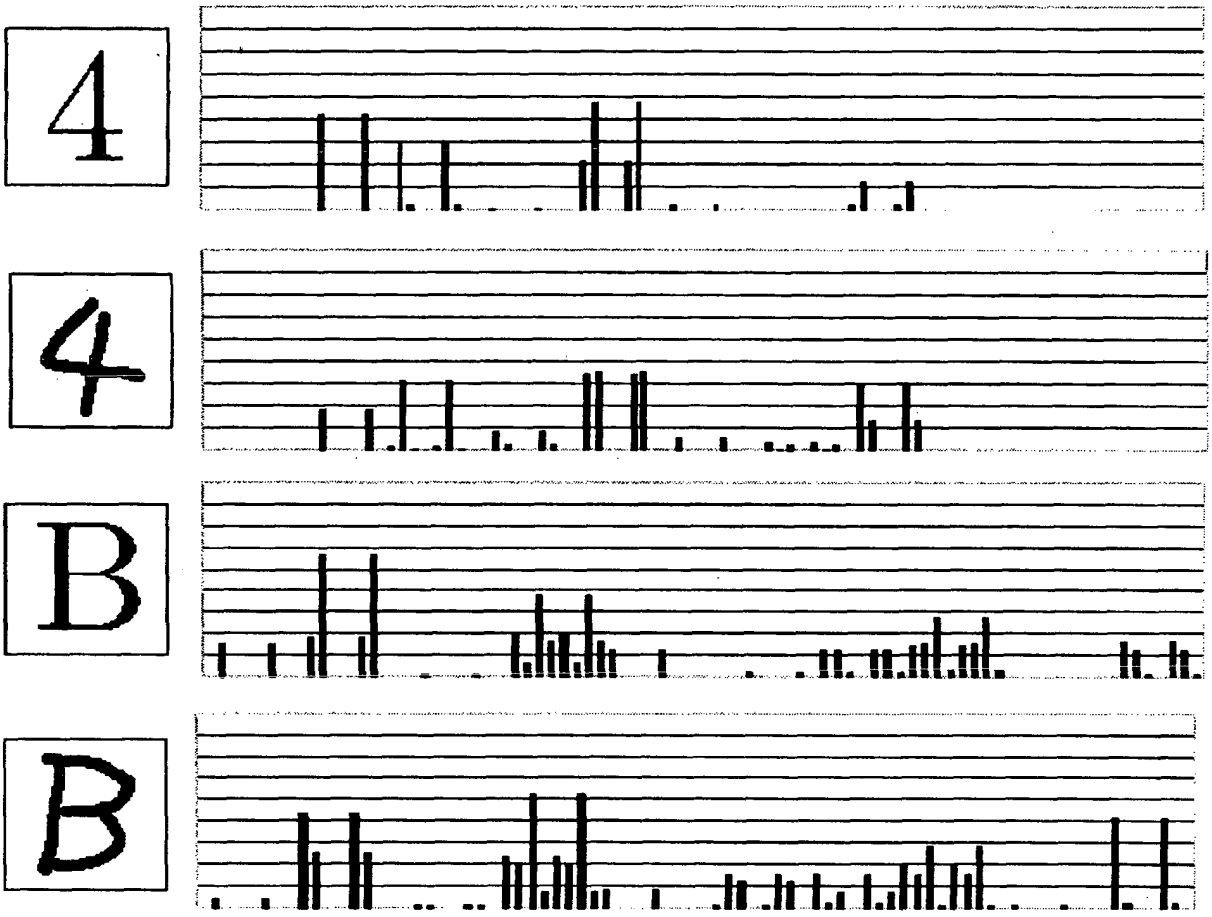


FIG. 25



EXAMPLES OF ONE–DIMENSIONAL MUMERIC VALUES (VECTORS)
GENERATED BY DISTRIBUTION MAPS
(NUMERIC CHARACTER "4" OF 72 PT EUCLID FONT
AND HAND WRITTEN CHARACTER "4")

FIG. 26

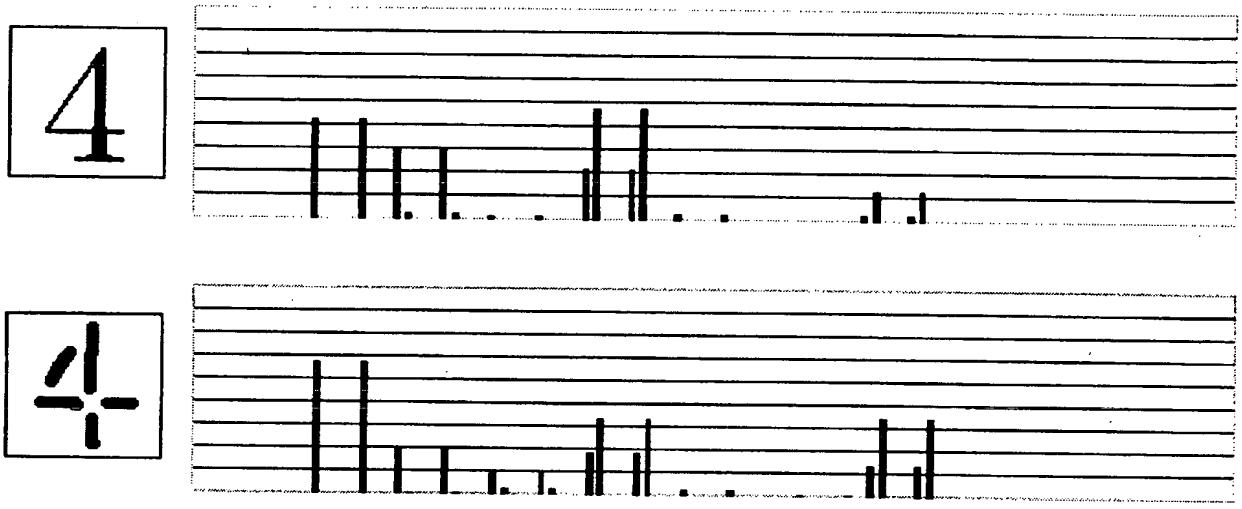


FIG. 27

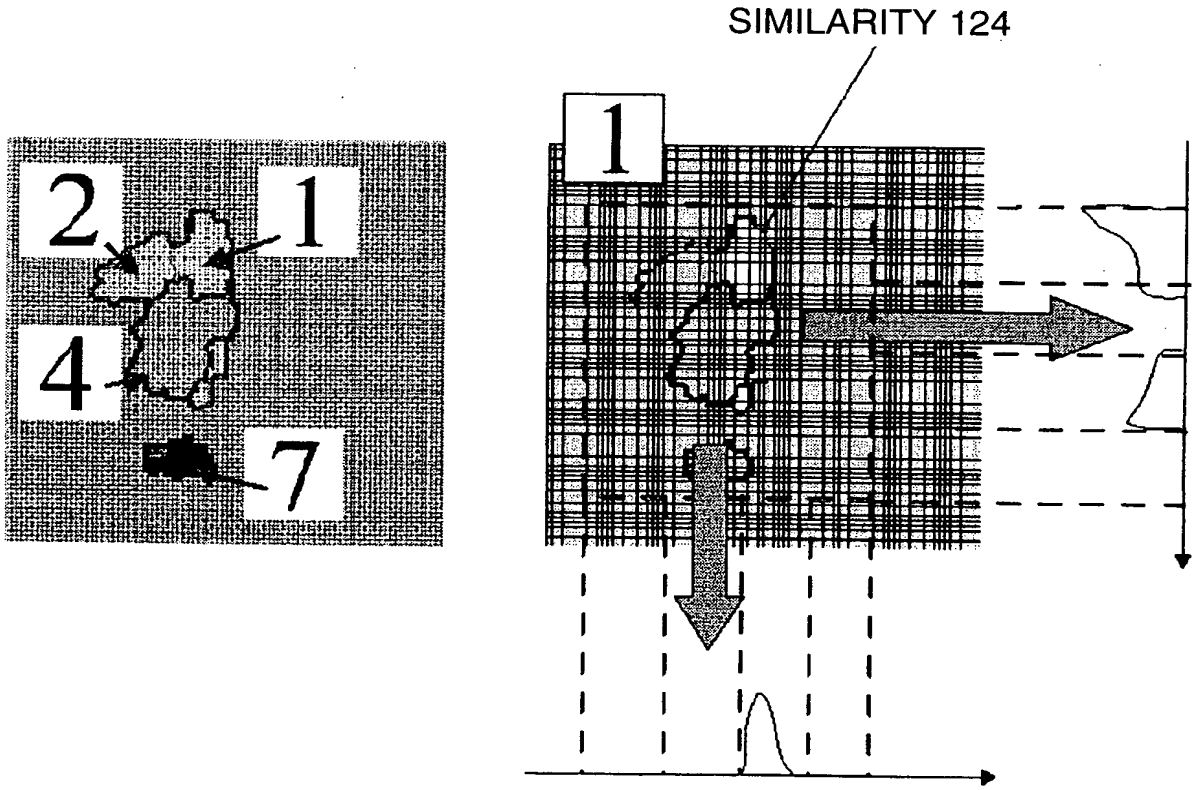


FIG. 28

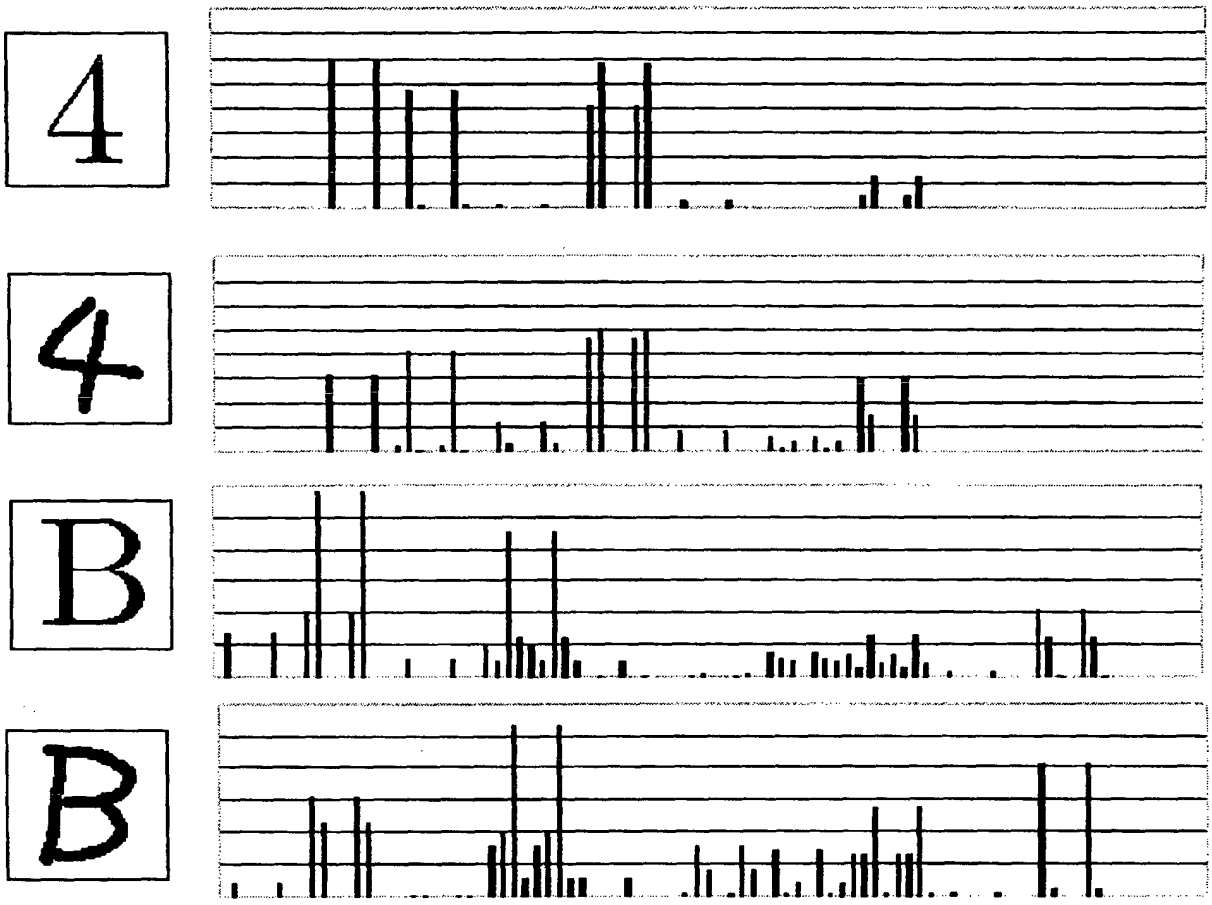


FIG. 29

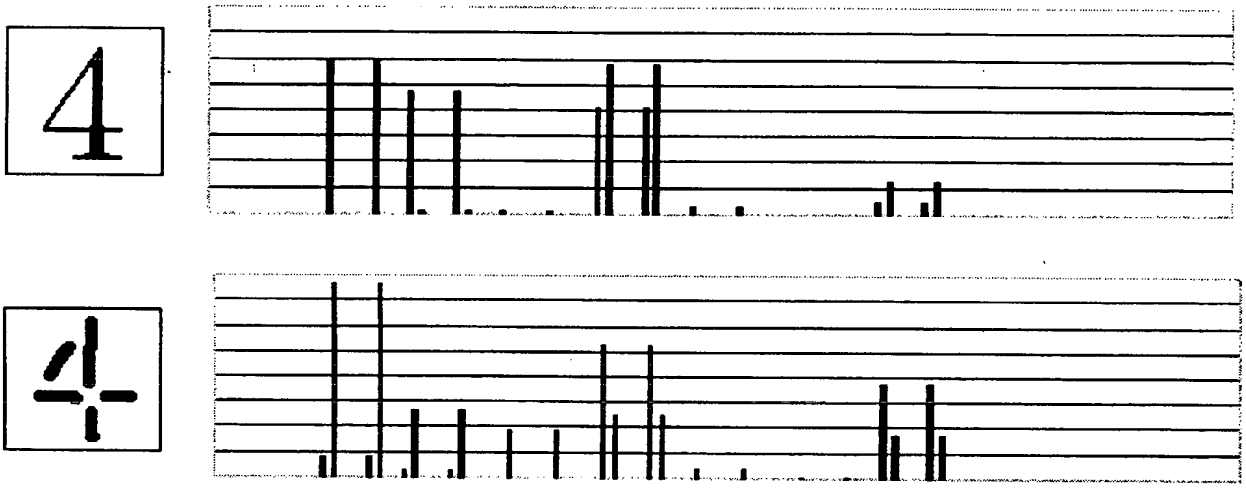


FIG. 30

6 7

6 7 7 8 9

FIG. 31

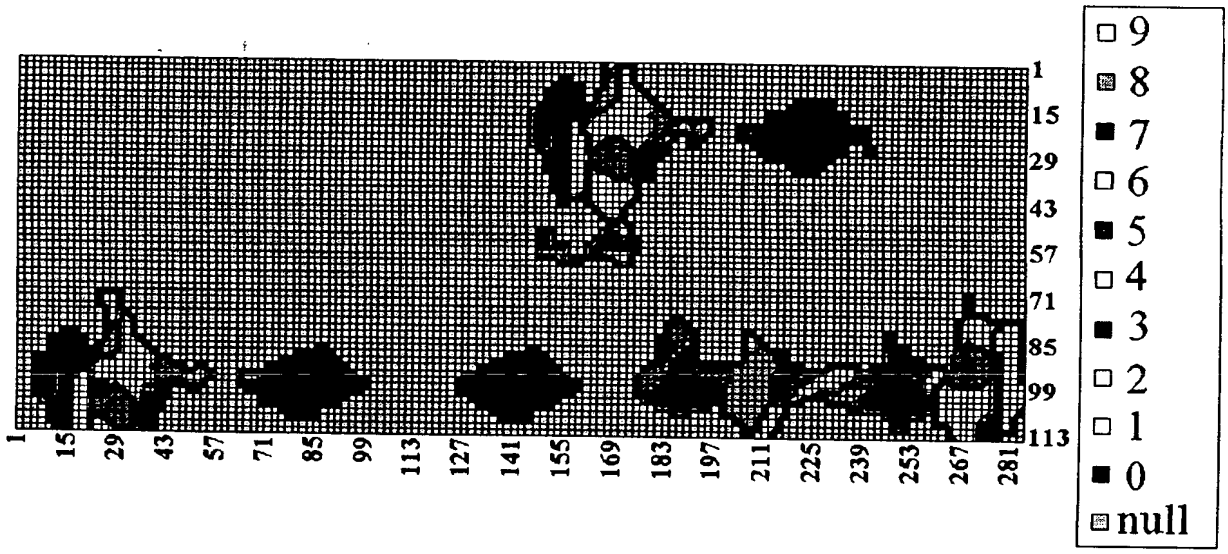

1
15
29
43
57
71
85
99
113
127
141
155
169
183
197
211
225
239
253
267
281
1
15
29
43
57
71
85
99
113
9
8
7
6
5
4
3
2
1
0
null

FIG. 32

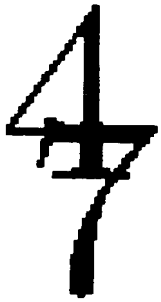


FIG. 33

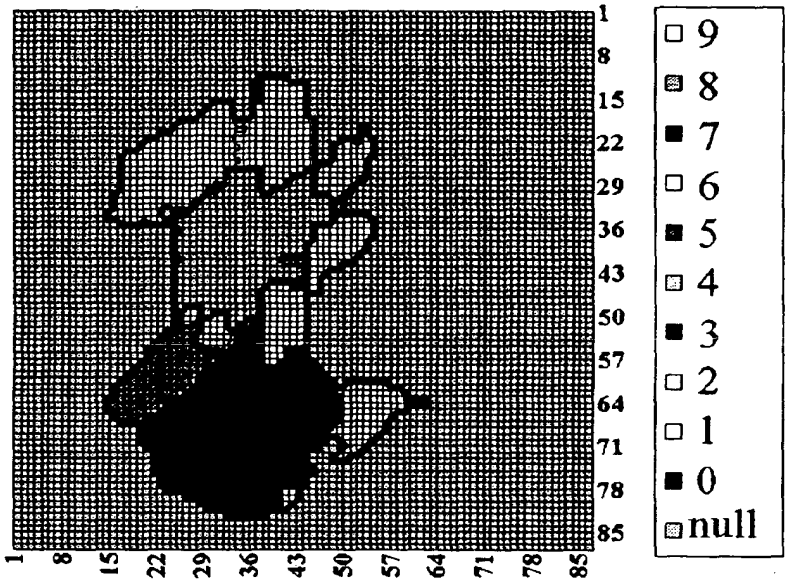


FIG. 34

FIG. 35

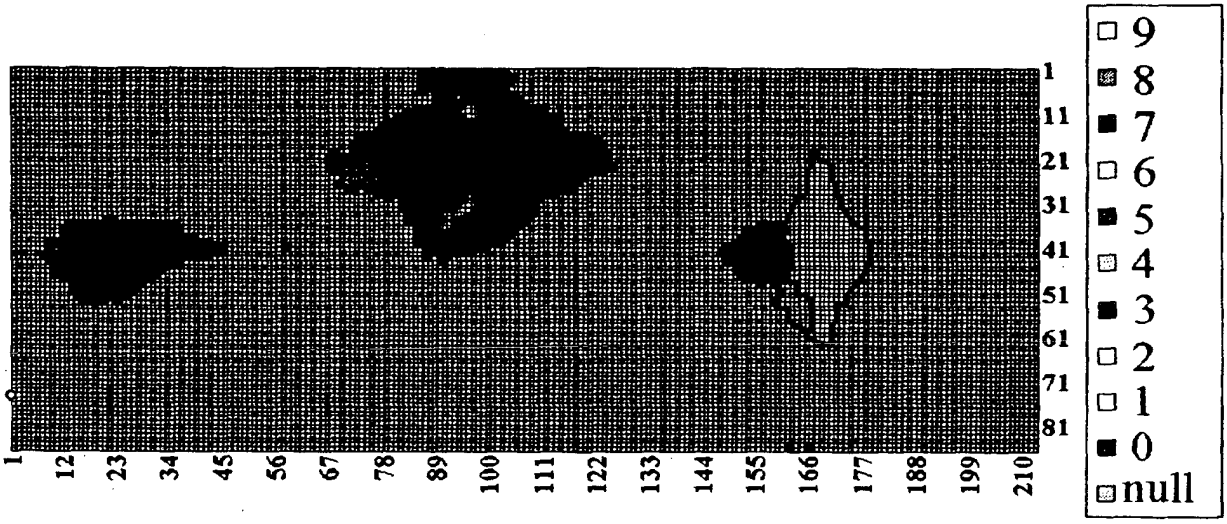

1
11
21
31
41
51
61
71
81
1
12
23
34
45
56
67
78
89
100
111
122
133
144
155
166
177
188
199
210
9
8
7
6
5
4
3
2
1
0
null

FIG. 36

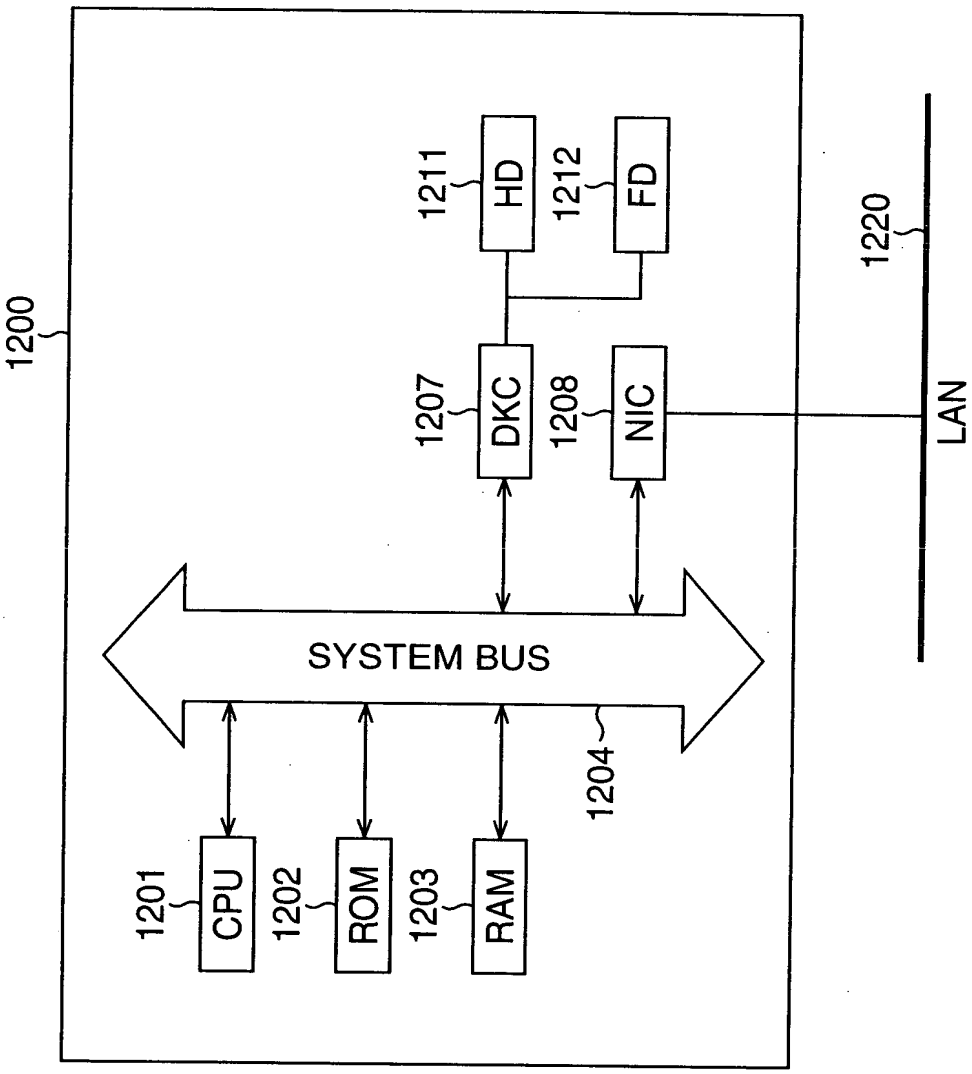
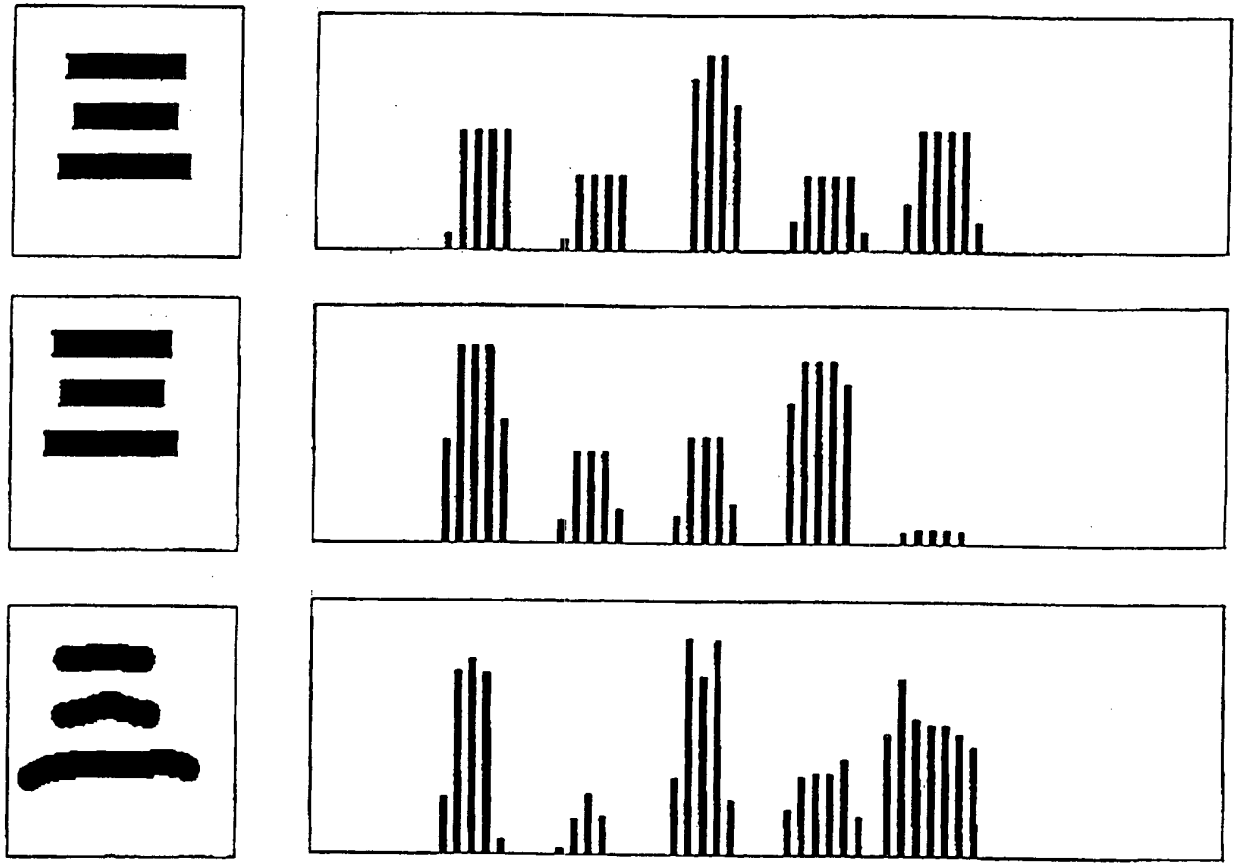

1200
1211
HD
1212
FD
1220
1207
DKC
1208
NIC
LAN
SYSTEM BUS
1204
1201
CPU
1202
ROM
1203
RAM

FIG. 37

ILL-DEFINED VECTORS